

Common MOA HEC RAS Issues Flagged By FMP

March 9, 2012

It should be noted that this list is not a definitive list of all that is reviewed during an MOA review. It is provided as a guide to ensure consistency and quality.

The following checked items have been reviewed and incorporated into the models as appropriate. [PROJECT TIP # or ID: _____]

Signature: _____

- ☐ 1. Confirm if **hydrology** in the effective model matches the FIS or not. If not, it should be noted in the project narrative. Use the flows which produce the effective water surface elevations. Flows should not change in any of the submitted models.
- ☐ 2. **Boundary Conditions:** If you are using a truncated model, then you should use a known water surface elevation the majority of the time and tie-in to within 0.5 ft. of the effective model at the upstream cross section in the model. (Show the Effective WSEL in the comparison table at tie points for review purposes.) Otherwise, if the model is not truncated, the boundary conditions should not vary from the effective model (anything may be possible, but there should be overwhelming evidence that the boundary condition is incorrect before it is revised from the effective model, and even then, it will only be done in the corrected effective and additional models). The Corrected and Revised Models should be extended until their water surface elevations and stream velocities match exactly. The top width should also match within a foot. The only exception to this would be if the effective model ends before the models are able to match.
- ☐ 3. **Floodway or Encroachment Surcharges:** Make sure they are no greater than one foot nor negative in the Corrected Effective or Revised Models. Negative surcharges are usually due to modeling error or over-encroachment around bridges and culverts.
- ☐ 4. **Revised – Corrected Effective WSEL's;** Revised WSEL's should be equal to or lower than Corrected WSEL's for MOA's.
- ☐ 5. Do not use **fixed water surface elevation** points at any locations in your models. The only exception to this would be use of "fixed" starting water surface elevation as boundary condition at most downstream section of a truncated duplicate effective model. FMP typically requests inclusion of a copy of the unedited full effective model for reference.

☐ 6. **Bridge modeling methods:** Set Max Submergence to 0.95 unless the engineer considers another number more appropriate. For low flow on the crossing in question, run “Momentum” as well as “Energy” for low flow and check “Use Highest Energy Answer.” If the engineer deems it appropriate, Yarnell can be checked as well, though it is generally not required. The “Add friction component” for momentum should be checked, but the “Add weight component” should not. For high flow on the crossing in question, check “Pressure and/or Weir” and set the Submerged Inlet + Outlet Cd. If the effective model does not include these modeling methods, they should be included in the Corrected and Revised Conditions models. For all other crossings in the model, do not change the modeling methodology unless the engineer determines that it is appropriate to do so. All changes in modeling should be described in the project narrative.

☐ 7. **Manning’s “n” changes** should be justifiable and stated in the project narrative. They should be supported with photographs. Manning’s “n” changes without documentation will not be accepted under the MOA.

☐ 8. **Contraction and expansion coefficients** should typically be 0.3 and 0.5 respectively for sections 4, 3, and 2 in the flow contraction and expansion reach associated with bridge and culvert structures. Contraction and expansion coefficients should be 0.1 and 0.3 in all other locations. If the effective model has other contraction and expansion coefficients and is older than 1998, the coefficients should be changed in the Corrected and Revised models to 0.1 and 0.3 unless the engineer deems it appropriate otherwise. Contraction and expansion coefficients should be discussed in the model narrative, and any changes from the effective model or use of non-typical values should be justified. Note Item 22 below regarding keeping any changes within the reach affected by the project – There is no need to correct the entire reach of the model outside of the influence of the project.

☐ 9. **Center reach lengths** should be the upstream station minus the downstream station. When these do not line up, it is noticed. Sometimes it is commented on and sometimes not depending on the effective model. Either way, attention should be paid to reach lengths during the model build, especially when adding in new cross sections or adjusting effective cross section locations.

☐ 10. **Encroachment station placement** should tie-in with the effective model stations at the upstream and downstream cross section in any truncated model. Other than that, all floodway encroachment stations should be placed in appropriate locations. They should be contained by the 100-yr floodplain boundary, be outside of bank stations and not be placed in the ineffective flow areas, etc. Always use Method 1 to set encroachment stations in the Duplicate Effective, Corrected, and Revised models. Changes in Encroachment Stations

more than 25' (on either side) from the Effective Model to the Revised Model will not qualify for an MOA Type 1, but will instead be a Type 2.

- ☐ 11. **The Structure Data (deck width, low chord, roadway grade, culvert inverts, etc.)** in the hydraulic model should match the data contained in the structure reports (BSR & CSR). Any datum adjustments between the structure reports and hydraulic model should be accounted for and noted in the narrative.
- ☐ 12. **Watch for datum adjustments.** For models with a different datum, make sure that boundary conditions are adjusted along with geometry. Make sure all plans (Corrected Effective and Revised) are adjusted.
- ☐ 13. **Geo-Referencing:** For any effective model which has been geo-referenced, geo-reference all new cross sections which have been added to the models.
- ☐ 14. Make sure your **bank stations are containing your stream** centerline in the geometric window from HEC-RAS.
- ☐ 15. **Ineffective areas:** Make sure up and down stream areas act together on either side of bridge (both are either effective or ineffective). Do not adjust ineffective flow areas anywhere else in the model unless the engineer deems it appropriate, and then it should be adjusted in both the Corrected and Revised models. Describe the placement and/or adjustment of ineffective flow areas in the project narrative.
- ☐ 16. **Model Submittal to FMP:** Only submit models with the same profiles that the Effective model used. If, say our design year is a 25yr event, add that profile and save as a design model but do not submit to FMP. Make sure all runs have an output file saved. Omit all extraneous runs and files.
- ☐ 17. **Levees** are not to be used unless it is a certified levee. Other techniques exist to block effective flow in the HEC-RAS environment.
- ☐ 18. **For project in a redelineated detailed study reach, send in effective HEC2 files** as part of the MOA package. In the event that an effective model for a **Re-delineated Detailed Study** was not available, submit documentation that an external data request (EDR) was submitted through FMP to FEMA NFIP Library with the result that no copy of the effective model could be found, thus verifying that “due diligence” was exercised in attempting to obtain the effective model.

☐ 19. **Model Version:** If there are discrepancies in the calculated water surface elevation between the Effective and Duplicate Effective models that appear to be due to respective differences in the version of HEC-RAS, such that the results do not match within the acceptable tolerance (0.5 ft. with no negative surcharge), then it is recommended that both models be compared by running them in the same version of HEC-RAS as the effective model. Legacy models of HEC-RAS can be downloaded at <http://www.hec.usace.army.mil/software/hecras/hecras-download.html>. If it is thereby determined that the newer HEC-RAS version results in discrepancies that exceed the acceptable tolerance, this should be documented in the HEC-RAS narrative.

☐ 20. **HEC-2:** HEC-2 may be used for the duplicate, corrected and revised models if the Effective model is also HEC-2; however, it is preferred that the Effective HEC-2 model be imported/converted to HEC-RAS. Care should be taken when converting HEC-2 data to HEC-RAS. The HEC-RAS model will likely require adjustments and corrections in order to match the effective results. The Duplicate Effective (imported) HEC-2 results should match the Effective HEC-2 results. If the model is converted from HEC-2 to HEC-RAS, the Duplicate Effective model must be in HEC-RAS. The Duplicate Effective software needs to match the Corrected and Revised model software.

☐ 21. **Summary:** The summary comparison table should include, at a minimum, the following information:

- Duplicate Effective, Corrected, and Revised results;
- Water surface elevations for the 1% and the floodway (encroachment) models and the difference between water surface elevations from the Corrected model to the Revised model;
- Encroachment stations and any changes in encroachment stations from the Effective model to the Revised model

☐ 22. **Corrected Model:** The Corrected model should be used to correct errors and omissions discovered in the Effective model. It should not be used to correct an entire reach. Therefore, corrections should be made in the area of influence of the project, but are not required beyond the point where the Corrected model and Revised model match. All corrections should be noted in the project narrative.